

Non-pharmacological motor-cognitive treatment to improve the mental health of elderly adults

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SUMMARY

OBJECTIVE: To propose a program of physical-cognitive dual task and to measure its impact in Chilean institutionalized elderly adults.

METHOD: Experimental design study with pre and post-intervention evaluations, measuring the cognitive and depressive levels by means of the Pfeiffer test and the Yesavage scale, respectively. The program was applied for 12 weeks to adults between 68 and 90 years old. The statistical analysis was based on the nonparametric Wilcoxon test for paired samples and was contrasted with its parametric version. The statistical software R was used.

RESULTS: Statistically significant differences were obtained in the cognitive level (p -value < 0.05) and highly significant (p -value < 0.001) in the level of depression with both tests (parametric and nonparametric).

CONCLUSION: Due to the almost null evidence of scientific interventions of programs that integrate physical activity and cognitive tasks together in Chilean elderly adults, a program of physical-cognitive dual task was proposed as a non-pharmacological treatment, easy to apply and of low cost to benefit their integral health, which improves significantly the cognitive and depressive levels of institutionalized elderly adults.

KEYWORDS: Cognitive Impairment. Depression. Dual Task. Elderly People. Physical Activity

INTRODUCTION

The aging process is characterized by the gradual accumulation of cellular and molecular damage during the entire human life¹. This accumulation produces widespread and progressive deterioration of the human body, besides of structural and functional changes that alter the psychomotor capacity². It also causes a greater vulnerability to environmental fac-

tors and increased risk of diseases and death¹. In addition to the biological and physiological problems, aging causes a decrease of the functions of the central nervous system³, related to an increase in mental disorders⁴ in elderly adults, referred to hereafter as EA." Among these age-related diseases are cognitive disorders such as mild cognitive impairment, de-

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mentia, and Alzheimer's⁵, as well as emotion disorders such as anxiety and depression. These mental pathologies have economic, social, and public health impacts in the communities⁶.

Cognitive dysfunction manifests progressively in people, starting with a mild cognitive impairment, a change in memory caused by aging, until it becomes dementia^{5,7,8}. Dementia is a deterioration of mental faculties that produces serious conduct disorders and prevents the EA from engaging in daily life activities⁵. Dementia affects more than 47 million people in the world, and it is estimated that, by 2030, more than 75 million people will have this pathology, a number expected to double by the year 2050⁷. Whereas mild cognitive impairment is a modification of the memory that is higher than that expected for a specific age and degree of formal education, but with no signs of dementia, allowing the EA to engage properly in their daily activities⁹.

One of the recurring emotional disorders in EA is depression⁵, a disease that reduces the quality of life of people considerably¹. Depression is affected by several factors, such as those of biological (neurochemical variations in the level of neurotransmitters or neuronal connections), psychological (history of mental illness, in the family or the individual), situational (stressful events), environmental (maltreatment, little exposure to sunlight), and sociocultural (loss of social functions) nature^{10,11}.

Regarding the strategies used to cope with the problems of aging, physical activity is perhaps the most successful¹⁰⁻¹². When practiced on a regular and systematic manner, it is a powerful tool that promotes the well-being of people, since it maintains and improves the skeletal-muscle¹³, cardio-respiratory¹⁴, endocrine-metabolic¹⁵, and psycho-neurological¹⁶ functions. The effects produced by physical activity in the nervous system are the least known; two examples are the neuronal plasticity^{17,18} and the increase in the activity of the hippocampus and of the neurotrophic factor, among others¹⁹. Thus, exercising not only improves physical health, but also mental health²⁰, leading to a lower incidence of cognitive deterioration²¹ and depression¹⁶.

The simultaneous implementation of physical exercise and cognitive tasks has been referred to as physical-cognitive dual task, abbreviated as "PCDT" from here on, which is defined as the interaction between physical activity and the cognitive processing of a task. For example, doing a

balance exercise while reading the newspaper. Among the advantages of PCDT programs are an improvement ambulation of EA, both in its rhythm as its speed²². Good results were also obtained when there are changes of tasks, for example, alternating attention between one task and another²³, or prioritizing a task focusing on one of two²⁴. Using PCDT programs, it is possible to see changes in physical performance and cognitive abilities of EA, due to the "bottleneck theory." In our context, this theory indicates that, due to the decrease in the processing of information, it is only possible to process one task at a time since the processing of a second task begins when the first ends. This "bottleneck" usually generates a higher response time for one of the two tasks when it uses a PCDT program, reducing the physical performance and cognitive capacity, which could be considered as a disadvantage. Several studies have demonstrated the positive effects of PCDT programs in EA, particularly its improvement in cognitive function²⁵⁻²⁷, emotional state¹⁰ and physical function²⁸. The implementation of PCDT programs also improves memory²⁹, selective attention¹⁸, reaction time²⁸, body awareness and spatial structure³⁰. Thus, the combination of physical and cognitive tasks benefits the cognition and emotional state of EA. To the best of our knowledge, no PCDT programs targeted at EA has been applied in Chile.

The objectives of this study are: (i) to propose a PCDT program for EA to reduce their levels of cognitive impairment and depression; and (ii) to measure the impact of this program in institutionalized Chilean EAs. The PCDT program is proposed as a non-pharmacological, easy implementation, and low-cost strategy to benefit the health of EA.

The article is organized as follows: the second section describes the method used, detailing the PCDT program proposed in this study, the subjects of study, the ethical aspects, the measuring instruments, the variables analyzed, and the experimental design used for the statistical analysis that will allow us to obtain information to validate this program. The third section introduces the case study and the statistical analysis of the experimental data that leads to numerical results that validate the PCDT program. The last sections provide a discussion of the research performed and the final conclusions. A complete and updated list of references accompanies this study.

METHODS

The PCDT program

The double task program for EA proposed in this study is divided into three units of work, detailed in Table 1, following the didactic principle from the simplest to the most complex. It is proposed that each unit lasts 12 sessions, with a frequency of three times per week (on non-consecutive days), repeating the same routine of physical exercises and cognitive tasks during each week to observe the advances on the PCDT Program, enhancing the learning ability and motivation of the EA.

We propose to conduct the sessions at a moderate intensity, according to the rating of perceived exertion (RPE), which goes from 6 to 20 points^{31,32}. The RPE of “moderate” intensity corresponds to the class between 40% and 59% of the heart rate reserve³³. This moderate intensity corresponds to 12 or 13 points of RPE, and from 6 to 20 points in the Borg scale³².

It is recommended that sessions last approximately 45 minutes, with each divided into three stages: warm-up, main stage and cool-down, detailed as follows:

Warm-up routine (8-10 minutes): the initial stage which prepares the body for the workout routine and is composed of articular mobility and of Tai Chi sequences (three to five sequences per session). This stage contains a system of psychophysical exercises that combine martial arts movements, breathing and stretching¹⁹. Tai Chi brings tranquility and relaxation to its practitioners and has a high healing power of physical and mental aspects, improving longevity¹⁹.

Main stage (25 -30 minutes): main stage focused on developing the objectives planned in each unit as described in Table 1. Physical activity should be multicomponent, combining the physical qualities of strength, stretching, balance, coordination and metrics, the latter which corresponds to the coordinated movement of the limbs. In addition, it is necessary to have three levels of exercise (basic, medium and

advanced), depending on the capabilities of the EA:

- Basic level: execution on sitting position/with or without implements.
- Medium level: execution on standing position/with or without implements.
- Advanced level: execution using displacement/with or without implements.

To reeducate, develop, and improve motricity, we propose three series per type of exercise, each series with 10 to 15 repetitions, according to the recommendations of the American College of Sports Medicine³⁴. Regarding the cognitive tasks, the following must be exercised (according to the order of the units of the PCDT program detailed in Table 1): body awareness, memory, and attention, as well as space-time orientation and reasoning. The physical and cognitive tasks must be done simultaneously or one immediately after the other.

Cool-down (5-8 minutes): the final stage whose goal is to bring the body back to the initial resting condition. With that purpose, a stretching session (which will be repeated every session to improve memorization) and conscious breathing (guided inhaling and exhaling) is conducted.

Subjects and ethical aspects

The subjects of study are EA, and each one of them, as well as their representative, must follow the study accordingly and sign an informed consent form indicating that they agree to participate in the research and that they have knowledge of the PCDT program.

Measuring instruments

The instruments used will be questionnaires drawn following the guidelines of the Ministry of Health of Chile (www.minsal.cl) to measure the levels of cognition and depression of EA³⁵. These questionnaires are the Pfeiffer^{36,37} test of mental state and the Yesavage³⁸ scale of geriatric depression, which are detailed below:

TABLE 1: UNITS OF PCDT PROGRAM AND THEIR OBJECTIVE

	Unit 1 “Movement and awareness”	Unit 2 “Movement and memory”	Unit 3 “Movement and orientation”
Objective	Reeducate motricity and body awareness through exercises for strength and elongation.	Develop motricity, attention, and visual memory through exercises for strengthening the body scheme and balance.	Improve motricity, reasoning, quality of movement and sense of direction through exercises of coordination.
Number of sessions	12	12	12

- **Pfeiffer Test:** also known as “short portable mental status questionnaire” and abbreviated as “SPMSQ”³⁶. This questionnaire is an instrument to assess the organic brain deficit in EA, easy to use, reliable, valid and brief, since it consists of 10 questions (see questionnaire in Annex 1). The test Pfeiffer assigns a score from 0 to 10, depending on the amount of incorrect questions answered, assigning one point for each incorrect question. The test corrects for schooling by subtracting from the total a point for EAs with basic or no schooling and adding a point to EAs with higher education. Then, on the basis of the errors made, these 10 questions measure the cognitive deterioration and determine its degree through four levels as follows: (0-2 points) normal, (3-4) light, (5-7 points), moderate and (8-10 points) severe.
- **Yesavage Scale:** also known as the “geriatric depression scale” and abbreviated as “GDS”³⁸. This questionnaire is an instrument to detect depression in EAs who are 65 years old or older of also easy application, reliable, valid and consists of 15 questions with dichotomous answers such as “yes/no” (see the questionnaire in Annex 2). Then, the Yesavage scale assigns a score from 0 to 15 following the sum indicated in the questionnaire in Annex 2 and classifying the level of depression of the EA as follows: (0-5 points) normal, (6-9 points) light, and (10-15 points) established.

The study variables and experimental design

An experimental design of the “pre and post-test” type is used by applying the aforementioned instruments to measure the cognitive level with the Pfeiffer test and depressive level with the Yesavage scale. These instruments are applied before and after

the intervention with the PCDT program, for twelve weeks, with each session of 45 minutes and a frequency of three times a week. The variables studied are defined in Table 2.

CASE STUDY RESULTS

Study subjects

This case analysis considers as study subjects (units of analysis) EAs institutionalized who lived in the retirement home “Silver House” (long-term stay private establishment) located in the community of Villa Alemana, V Region, Chile. The sample comprised 15 EAs institutionalized; however, after applying the inclusion criteria and due to the death of one of them, the sample included 10 EAs institutionalized ($n = 10$), 6 women and 4 men, with ages between 68 and 90 years. This sample is considered random, since “Silver House” can be considered a retirement home representative of long-term stay establishments in Chile. The criteria for inclusion in the sample were the following:

- EAs institutionalized at the retirement home “Silver House”.
- Age equal or over 65 years.
- Absence of a declared psychiatric pathology.
- Motor functionality compatible with the PCDT program proposed.

Data

The PCDT program proposed was applied to EAs institutionalized in the sample mentioned by two physical education teachers for twelve consecutive weeks. The data collection, using the instruments mentioned, was performed by the kinesiologist of the “Silver House”, who interviewed the EAs three days before the program was implemented and three days after its last application. The kinesiologist re-

TABLE 2: VARIABLES STUDIED, THEIR RATING AND MEASURING INSTRUMENT

Rating	Variable	Measuring instrument
X1	Cognitive level of EA before the intervention	Pfeiffer Test (from zero to ten points: 0-10)
X2	Level of depression of the EA before the intervention	Yesavage Scale (from zero to fifteen points: 0-15)
Y1	Cognitive level of the EA after the intervention	Pfeiffer Test (from zero to ten points: 0-10)
Y2	Depression level of the EA after the intervention	Yesavage Scale (from zero to fifteen points: 0-15)
Z	Age of EA	(in years)

corded the EAs' answers in the questionnaires, and the data were digitally recorded using Office Excel. The data are shown in Table 3 and were analyzed with R (www.R-project.org), a free statistical software to make graphs and analysis of data widely used by the international scientific community. As mentioned, the unit of analysis is the institutionalized EA of the sample mentioned and the variables studied are defined in Table 2. According to the type of variable denoted in Table 2, such as X1, X2, Y1, Y2, and Z, the data analysis was based as follows:

- (i) Descriptive statistical methods uni- and bivariate (correlation analysis).
- (ii) Parametric and non-parametric statistical hypothesis tests for paired samples.

Statistical analysis

Table 4 and Figures 1 and 2 present a descriptive summary and uni- and bivariate graphs of the variables studied for $n = 10$ EA. This aspect is very important to decide what type of inferential statistical method should be used to assess whether the PCDT program significantly improves or not cognitive levels and depression of EAs.

Based on the results obtained in the exploratory analysis of the data to assess whether the PCDT program significantly improved or not the EAs' cognitive and depression levels, the Wilcoxon non-parametric test for paired samples was applied. As comparison and validation, the p-value of the Wilcoxon test is accompanied by the p-value of the statistical test corresponding to its parametric counterpart, that is, the Student-t test for paired samples. The results of both tests for the cognitive and depression levels, in

TABLE 4: DESCRIPTIVE SUMMARY OF THE VARIABLES AND UNITS OF MEASUREMENT LISTED IN TABLE 2 FOR EA DATA

Variable	Mean	Standard deviation	Coefficient of variation	Coefficient of asymmetry	Coefficient of kurtosis
X1	4.0	2.981	74.5%	0.611	2.152
X2	2.3	1.767	76.8%	0.461	1.551
Y1	6.3	3.467	5.0%	0.263	1.258
Y2	4.2	3.676	87.5%	0.799	2.414
Z	81	7.846	9.7%	-0.324	1.609

accordance with the computational output of the R software, are shown in Table 5.

Based on the analysis of data it is possible to obtain the following information relevant to assessing the hypothesis of this research:

The cognitive levels of EA measured before and after the intervention showed an asymmetric distribution (non-normal or Gaussian), a situation that is repeated with the remaining variables under study with different degrees of asymmetry and kurtosis. It is important to remember that the normal distribution has coefficient of asymmetry equal to zero and a coefficient of kurtosis equal to three. In addition, even if the sample obtained can be regarded as representative of the population of Chilean EAs institutionalized, the information of the sample presented in Table 5 should be understood as correspondent to a small sample and could be different in a larger sample. Nevertheless, due to the characteristics of this sample, the results are statistically valid.

The lack of normality of the data, for the different variables studied, requires the use of non-parametric inferential methods. In the present study,

TABLE 3: DATA OBTAINED FOR THE VARIABLES AND UNITS OF MEASUREMENT LISTED IN TABLE 2.

Patient	Z	X1	Prior level of deterioration (Pfeiffer test)	X2	Post level of deterioration (Pfeiffer test)	Y1	Prior level of depression (Yesavage scale)	Y2	Post level of depression (Yesavage scale)
1	89	7	Moderate	2	Normal	10	Established	8	Light
2	77	6	Moderate	4	Light	3	Normal	0	Normal
3	80	5	Moderate	5	Moderate	12	Established	12	Established
4	90	10	Severe	5	Moderate	3	Normal	4	Normal
5	79	3	Light	1	Normal	8	Light	6	Light
6	90	3	Light	2	Normal	4	Normal	1	Normal
7	85	2	Normal	2	Normal	9	Light	5	Normal
8	82	2	Normal	1	Normal	3	Normal	2	Normal
9	70	2	Normal	1	Normal	3	Normal	2	Normal
10	68	0	Normal	0	Normal	8	Light	2	Normal

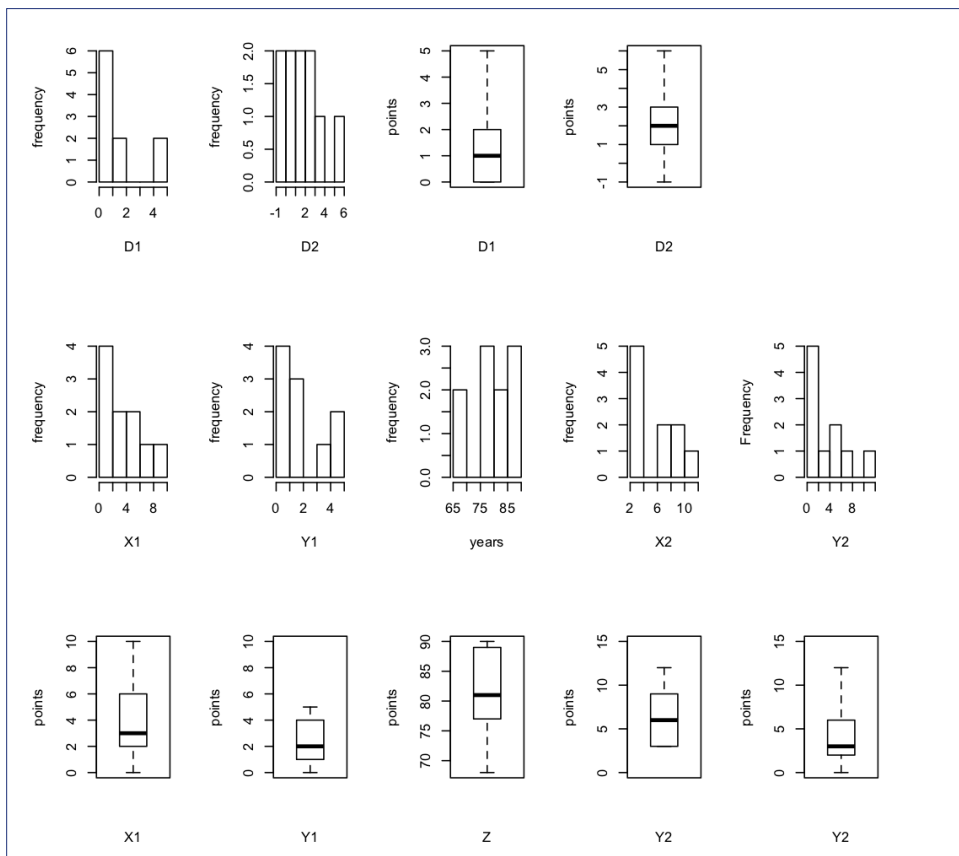


FIGURE 1: HISTOGRAMS AND BOXPLOT OF VARIABLE INDICATED FOR EA DATA.

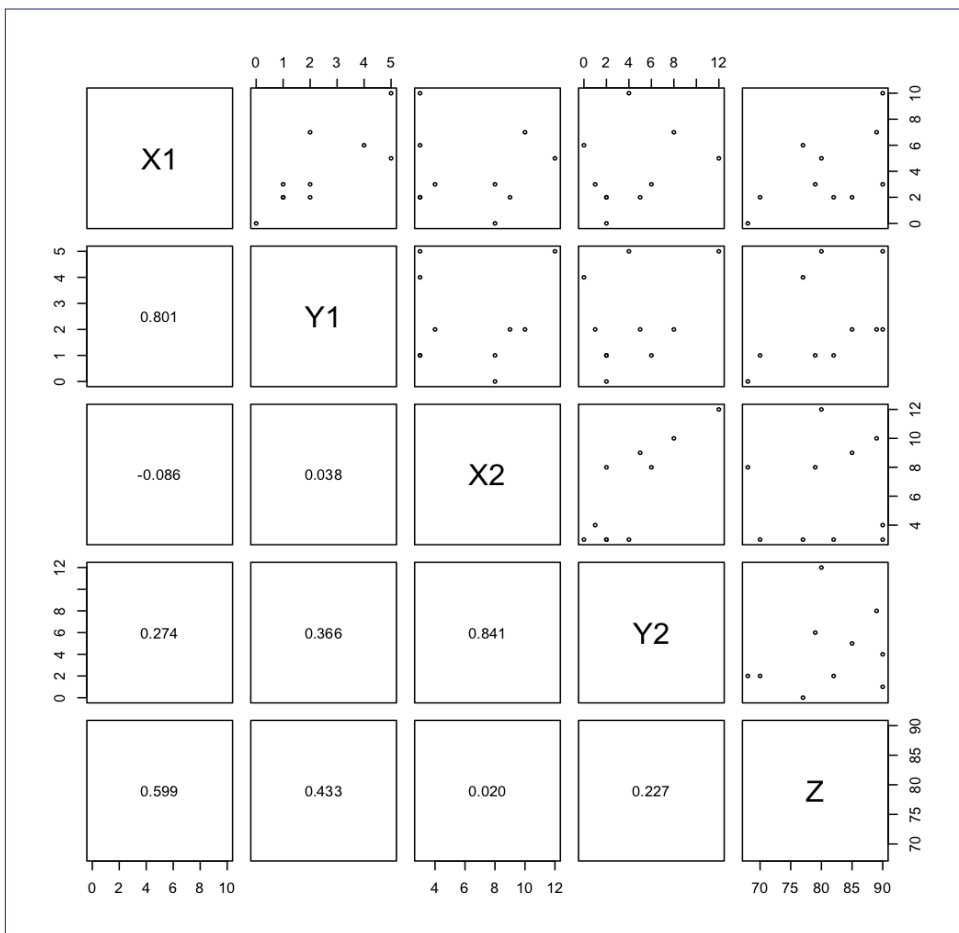


FIGURE 2: SCATTER DIAGRAMS AND THEIR PEARSON CORRELATION OF THE VARIABLES LISTED FOR EA DATA

TABLE 5: P-VALUE OF THE TEST AND VARIABLE INDICATED WITH EA DATA

Variable	Wilcoxon test	Student-t-test
D1 = X1 - Y1	W = 28; p-value = 0.0211 Alternative hypothesis: Median different from zero	T = 2.8465; degrees of freedom = 9; p-value = 0.0192 Alternative hypothesis: Mean different from zero Confidence interval of 95%: [0.3490; 3.0510] Sample mean of differences: 1.7
D2 = X2 - Y2	W = 43; p-value = 0.0172 Alternative hypothesis: Median different from zero	T = 3.2796; degrees of freedom = 9; p-value = 0.0095 Alternative hypothesis: Mean different from zero Confidence interval of 95%: [0.6515; 3.5485] Sample mean of differences: 2.1

this method corresponds to the Wilcoxon signed-rank test. In any case, as mentioned, to compare and validate the parametric statistical test equivalent to the Wilcoxon test, that is, the Student-t test, is also applied and reported.

From the exploratory analysis (see Table 5 and Figure 1), we can observe that the variability of cognitive levels of the EAs decreases after the intervention. This is relevant because the PCDT program transformed the EA sample into a more homogeneous group in cognitive level. However, this aspect reverses when the level of depression is assessed. This means that the PCDT program transformed the EA sample into a less homogeneous group in terms of depression.

The bivariate exploratory analysis provided in Figure 2 shows there is a high correlation between the cognitive levels before and after the intervention, a situation that is repeated with the level of depression. This implies that the hypothesis of independence necessary to use a usual parametric statistical test for comparing the means or medians is not valid. This invalidation is resolved by applying a test for paired samples, which simply means to analyze data from the differences in the cognitive levels (or depression) instead of the original data.

In Figure 1, it is possible to note that the differences between the cognitive levels of EAs before and after the intervention still do not have a non-normal distribution, requiring once again the use of the Wilcoxon non-parametric test. Once more it is accompanied by the Student-t test for comparison and validation, despite its incompatibility with the data from the differences in levels. Nevertheless, this non-normally detected in the distribution of cognitive levels does not seem to be violated in the depression levels, for which the normality it is observed as a reasonable hypothesis, based on the evidences available from the sample. This implies that, for data of differences in levels of depression, the Student-t test for paired

samples is a valid method for assessing whether the PCDT program significantly improved or not the levels of EA depression. In any case, and again as a comparison and validation, the results of the Student-t test are accompanied by those obtained from the Wilcoxon test.

From Table 5, we concluded that the PCDT program proposed in this research allows to improve significantly (Wilcoxon test p-value = 0.0211; Student-t test p-value = 0.0192) the EA cognitive level in 5%, increasing this level by 1.7 points in the Pfeiffer test, with a confidence interval of 95% of [0.3490; 3.0510] points in this test.

Also based in Table 5, we concluded that the PCDT program proposed in this research has significantly improved (Student-t p-value = 0.0095; Wilcoxon p-value = 0.0172) the level of EA depression in 1%, improving this level by 2.1 points on the Yesavage scale, with a confidence interval of 95% of [0.6515; 3.5485] points on this scale.

Another interesting result obtained from the statistical analysis of the data that leaves one open problem that should continue to be studied is the relationship between levels of cognition and depression and the ED age. In Figure 2, it is possible to observe that there are very reasonable correlations between age and the mentioned levels. In addition, it shows that the PCDT program proposed produces an interesting effect on the EDs, since that age seems not to have an impact on these levels after the intervention, producing an equilibrium at such levels regardless of age.

DISCUSSION

The main objective of this study was to propose a PCDT program to improve the levels of EA cognition and depression. After the implementation of the PCDT program and analyzing the statistical results, it is possible to declare that the EA who participated

in the program showed significant cognitive improvement, as well as a highly significant improvement in their depressive state from a statistical point of view.

The results of previous studies show that physical activity alone improves the EA cognitive level^{18,27,36}. Nevertheless, it has been demonstrated that there is a greater improvement in cognition when the physical training is combined with cognitive tasks^{10,21,29,39-41} in comparison with physical training or cognitive tasks alone²⁵. The present study employed a different methodology, without groups with physical activity or only cognitive tasks alone; therefore, it is not possible to confirm this statement. However, other studies^{10,25,40,41} confirm the line of action taken in our research, allowing us to conclude that the PCDT program is a good intervention to improve EA cognition. It has been demonstrated that this type of intervention brings benefits to the independence and well-being of EA^{21,26}, mainly by significant improvements in the speed of information processing^{25,28-30}, the cognitive component used in most of the activities of daily life. However, the present study cannot prove such conclusions, since it did not employ an evaluation instrument for the functionality of the EAs; it only measured the general cognitive level through the Pfeiffer test. The results of the PCDT program of this research coincide with the improvements in EA cognitive levels^{21,29,30,41} and depression^{10,16,25} after participating in a program with physical and cognitive components.

The improvement of the cognitive level is given by the specific improvement of its components, such as memory^{19,25,29}, attention^{25,30}, body awareness, and spatial orientation³⁴. Although this study did not include a specific evaluation of each cognitive component, the results coincide with previous research, showing an improvement in the post-test cognitive level results.

The institutionalized EA suffer from a greater number of pathologies, and neuropsychological diseases are more severe than in non-institutionalized EA who remain with their families¹⁰. This contributes to a high level of fragility and a drop in the functionality²⁵ of the institutionalized EA. With this same argument, some authors¹⁰ have indicated that there are other factors that could be added to the sources of stress experienced by institutionalized EA in developing countries, such as an inadequate infrastructure, low professionalism of staff responsible for their care, and lack of comprehensive treatments, which also generate a negative impact on the emotional and cognitive aspects of the EA.

The results obtained in previous studies¹⁰ have demonstrated the effectiveness of a combined training program on the improvement of emotional, cognitive, and independence abilities. After one year of the intervention with institutionalized EA, the authors¹⁰ observed a positive trend of the program in reducing the levels of anxiety and depression in male EA. In addition, the cognitive deterioration of the EA did not increase throughout the sample. A recent study²⁸ confirmed these results with an eight-week intervention on institutionalized EA. It found significant improvements in physical condition, visual attention, executive functioning and speed of information processing. This proved the impact of such a type of programs in EA functionality, even of institutionalized ones. These results are related to the results obtained in the present study, since after the implementation of the PCDT program there was a statistically significant improvement in both cognitive and depression levels of the institutionalized EA.

Based on the results of this study, we concluded that the implementation of a PCDT program improves significantly the cognition and depression of institutionalized EA. This is reason enough for us to consider this type of intervention as a new form of complementary non-pharmacological treatment that is low cost and easy to implement to EA.

ANNEX 1: PFEIFFER TEST

Instructions: Ask from number 1 to 10 and complete the answer. These should be answered by the elderly individuals without seeing a calendar, newspaper or another element that facilitates the correct answer.

1.	What day is today?	(+)	(-)
2.	What day of the week is today?		
3.	What is this place or building called?		
4.	What is your phone number? What is your address? (only if there is no telephone)		
5.	How old are you?		
6.	What is the date of your birth? (Month/Day/Year)		
7.	Who is the current president of Chile?		
8.	Who was the previous president?		
9.	What is your mother's last name?		
10.	Subtract 3 from 20 and continue to subtract 3 from each result until it is no longer possible to continue (20-17-14-11-8-5-2).		
TOTAL OF MISTAKES			

Formal education: Basic or no education () Medium education () Higher education ()

Note: Subtract one in case of basic or no education. Add one in case of higher education.

Instructions for correction:	
Questions 1 and 6	It will be considered correct only the exact day, month and year.
Question 2	Self-explained.
Question 3	It will be marked correct if there is some description of the place.
Question 4	It will be correct by confirming the phone number or full address
Question 5	It will be correct if it matches with the date of birth.
Question 7 and 8	It will be correct if they say the last name of the President.
Question 9	It will be correct if they say what is in the clinical record.
Question 10	It will be correct only if the whole series is correct (20-17-14-11-8-5-2).

Evaluation of the results	
Number of mistakes	State
0-2	Normal (no cognitive deterioration)
3-4	Light cognitive deterioration
5-7	Moderate cognitive deterioration
8-10	Severe cognitive deterioration

ANNEX 2: YESAVAGE SCALE

Instructions: Answer each of the questions about how you felt during the last week.

Are you satisfied with your life?	yes	NO
Have you noticed a decrease or lack of interest in many of previous interests or activities?	YES	no
Do you feel your life is empty?	YES	no
Do you often feel bored?	YES	no
Do you feel excited most of the time?	yes	NO
Do you worry or fear that something might happen?	YES	no
Do you feel happy most of the time?	yes	NO
Do you often feel helpless?	YES	no
Do you rather stay at home than go out and do new things?	YES	no
Do you feel you have more memory problems than other people your age?	YES	no
Do you believe it is wonderful to be alive?	yes	NO
Do you feel useless or despicable in your current state?	YES	no
Do you feel energized?	yes	NO
Do you find yourself hopeless about your current situation?	YES	no
Do you believe other people are, in general, better off than you are?	YES	no

Assign a one (1) to each answer with YES (in capital letters) or with NO (in capital letters) and a zero (0) otherwise, that is,

YES = 1; yes = 0; NO = 1; no = 0, Total = __

Evaluation of the results	
Points	State
0-5	Normal (without depression)
6-10	Moderate depression
11-15	Established depression

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RESUMO

OBJETIVO: Propor um programa físico-cognitivo e medir seu impacto em idosos institucionalizados chilenos.

MÉTODO: Estudo de planejamento experimental com avaliações pré e pós-intervenção, medindo os níveis cognitivo e depressivo por meio do teste de Pfeiffer e da escala de Yesavage, respectivamente. O programa foi aplicado por 12 semanas a idosos entre 68 e 90 anos de idade. A análise estatística foi baseada no teste não paramétrico de Wilcoxon para amostras pareadas e foi contrastada com sua versão paramétrica. O software estatístico R foi utilizado.

RESULTADOS: Diferenças estatisticamente significantes foram obtidas no nível cognitivo ($p < 0,05$) e altamente significante ($p < 0,001$) no nível de depressão com ambos os testes (paramétrico e não paramétrico).

CONCLUSÃO: Porque quase não existe evidência científica de programas de intervenções que integram a atividade física e tarefas cognitivas em chilenos idosos, um programa físico-cognitivo foi proposto como tratamento não farmacológico, fácil de implementar e de baixo custo, para beneficiar a sua saúde integral, melhorando significativamente os níveis cognitivos e depressivos de idosos institucionalizados.

PALAVRAS-CHAVE: Atividade Física. Depressão. Deterioração Cognitiva. Dupla Tarefa. Idosos.

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